REMARKS

Applicants have carefully considered this Application in connection with the Examiner's Final Office Action of August 10, 2006, and respectfully requests reconsideration of this Application in view of the above amendment and the following remarks.

Applicants have cancelled Claims 29-57, 64, 69, and 70. Applicants have amended Claims 1 and 58 to provide that the steps of "ordering" and "producing an ordered list" are performed using 2-D geometry from multiple orthographic views. Support for this amendment can be found in the specification at Paragraphs 59, 64, 65, and 74, which all discuss the use of more than one orthographic view. The definition of "features library" given on Page 40 also includes the explanation that the library contains "a class to contain the original two-dimensional drawing split into orthographic views." Applicants have also amended Claims 65 and 72 to clarify the claim language.

Pending claims in the Application are: Claims 1, 6-13, 19-22, 24, 26, 28, 58-63, 64-68, 71 and 72.

I. Drawings

Applicants wish to thank the Examiner for withdrawing the objections to the drawings.

II. Claim Objections

Applicants wish to thank the Examiner for withdrawing the objections to the claims.

III. Election/Restrictions

Applicants have cancelled Claims 29-57, 64, 69, and 70 in accordance with the Examiner's instructions.

IV. Rejections Under 35 U.S.C. §112, Second Paragraph

Claims 65 and 72 stand rejected pursuant to 35 U.S.C. §112, second paragraph, as being indefinite. The Examiner has indicated that it is unclear which of the limitations in these claims pertain to steps (a), (b), (d), and (e).

Applicants have amended Claims 65 and 72 above to clarify which of the listed claim limitations pertain to steps (a) and (b) in Claim 65 and steps (d) and (e) in Claim 72. Applicants respectfully request that this rejection be withdrawn.

V. Rejections Under 35 U.S.C. §103(a)

A. NPL Document By Balachander

Claims 1, 6-13, 19-22, 24, 26, and 28 stand rejected under 35 U.S.C. §103(a) as being unpatentable over the NPL Document "Form Feature Extraction from 2-D Orthographic Views" by Balachander ("Balachander"). The Examiner asserts that Balachander teaches all of the limitations of these claims. Applicants respectfully disagree. Claim 1 has been amended to require that the step of "ordering the plurality of built features" is done using 2-D geometry from multiple orthographic views of the built features.

Balachander teaches the process of identifying features formed by simple and generic 3-D shaped elements such as cones, spheres and parallelopipeds. A study of the "feature database" mentioned in Section 5.4.5, pages 54-56, of Balachander clearly shows that it does not store any data pertaining to the features in the 3-D domain other than elementary parameters such as height, length and depth of the generic shapes. No information on the 3-D plane/coordinate system is present in the output format of the data file. Also, Balachander does not teach or suggest the step of ordering the features identified. The step of "consider[ing] the feature loops" identified by the Examiner on Page 49 of Balachander does not constitute ordering features as that step is meant in the claims. The loop hierarchy described in Page 49 of Balachander performs a simple extent-wise classification of the feature loops. This is done for only one orthographic view. **Claim 1 has been amended to require that the ordering is done based on multiple orthographic views in the drawing**. The list

of features on pages 54-56 of Balachander does not show any resolution of feature order or dependency. As a result of the absence of feature ordering, it cannot and does not describe any process of building the three-dimensional model from the identified features. The ordering of features and the building of the three-dimensional model are required in Claim 1.

Also, Balachander was published in 1994 and necessarily does not teach or suggest the complexity of the method described in the current claims. For example, the mechanical feature-based CAD domain has undergone drastic changes. Each of these features is much more sophisticated in nature. All of these recently-added, sophisticated features are recognized and encompassed by the claims involving the process of identifying and creating three-dimensional models.

Furthermore, the term "neutral file format" discussed in Balachander refers to the input 2-D drawing only. In the present claims, there is no restriction of the input drawing format. The term has a totally different meaning from that used in the claims, where it refers to the format of the three-dimensional model as being "application neutral." The advantage of using a neutral format is to be able to export and view the model in any CAD system, as long as reader and writer interfaces to that system are implemented. The section "isolated features previously recognized ..." in Balachander refers only to the simple generic elements discussed earlier (cone, sphere and parallelopiped). Also, the phrase "stored in a feature database..." is generic technical jargon and bears no relevance to the claimed step of "storing the representation in a binary file format."

The term "constraints" used in describing the charts on Page 18 and Page 56 of Balachander refers to the parameters for that feature whereas the same term in the context "feature class comprises feature geometry, feature constraints..." of the claims refers to the relationship that a particular feature bears to its parent as well as descendent features. The distinguishing factor here is that the constraints in the claimed process are created to capture the designer's intent behind the geometry whereas the corresponding sections in Balachander refer merely to the correct creation of the geometry.

Claims 6-13, 19-22, 24, 26, and 28, due to their dependence on Claim 1, are patentable over Balachander for the reasons discussed above. In addition, with regard to the rejections of Claims 6-7, the sections of Balachander cited by the Examiner are not extensive enough to teach the entirety of the subject matter of Claims 6 and 7. Much of the form feature information in Balachander is essentially still stored in 2-D loop stages. In the current claims, full-fledged object-oriented libraries exist that describe in its entirety the three-dimensional model, including the 2-D feature profile, the 3-D plane and coordinate system information on which the feature is built and its extent.

With regard to the rejections of Claims 8-10, these claims describe the process of applying object-oriented relationships between the individual dependent feature data. The Examiner has rejected these claims by citing teachings in Balachander that do not teach or suggest the claimed subject matter. First of all, the code in Balachander was implemented using C (see Page 61 of Balachander). A study of the pseudo code on Pages 74-75 of Balachander clearly shows the absence of any evidence of storing the 3-D feature data in object-oriented data structures. Further, a study of the Find_Loop hierrarchy module reveals the fact that the feature loops are not ordered using the information from all the orthographic views together but in fact, only for the current view. Also, no information can be deduced about feature ordering resolutions in the event that multiple parent loops exist for a particular feature loop.

With regard to the rejections of Claims 11-13, the context of the term "planes" in the cited sections of Balachander (i.e., "**extraction of feature whose axes are either parallel or perpendicular to one of the three principal planes**") is not the same as that in the rejected claims. This section of Balachander only refers to the limitation in the feature identification process. Features located on a plane other than the principal axes could not be identified. As mentioned earlier, the features identified in Balachander do not store any information related to their positioning in the 3-D Plane system and as a result cannot be built in 3-D space. Although the Examiner mentions "these features have an elevation from a given world origin...ground from which the 3-D shape rests on" in the explanation of the rejection, Balachander does not store the same "elevation" data that is essential for future creation in a 3-D model. Claims 11-13 require this capability.

In the rejection of Claim 19, it should be noted again that the term "constraints" used in describing the charts on Page 18 and Page 56 of Balachander refers to the parameters for that feature whereas the same term in the context of Claim 19 refers to the relationship that a particular feature bears to its parent as well as descendent features. The distinguishing factor is that the constraints in the claimed process are created to capture the designer's intent behind the geometry whereas the corresponding sections in Balachander refer merely to the correct creation of the geometry.

With regard to Claims 20-21, these claims require the capability of the input two-dimensional view to be stored along with the three-dimensional model in the binary file format. The motive behind this capability is to provide subsequent 3-D model verification. This is not what is taught in Balachander when it states "The coordinates of the start and end points...are normalized with respect to a common origin" on page 26. This page discusses the process of customizing the input drawing prior to the process of feature extraction. Balachander does not provide any discussion about providing model verification capability.

Referring to the rejections of Claims 22 and 24, Figure 2.1 on Page 9 of Balachander merely shows the classification of the form features, as widely available in general mechanical CAD literature back in 1994. It has no relevance to the term "ordering of built features" used in the pending claims. The claim term refers to the completely resolved order of individual 3-D features required while building the three-dimensional model and the claims refer to the process of transfer of model data based on this ordering. Balachander does not teach or suggest the resolution of feature order.

With regard to the rejection of Claim 26, there is no teaching or suggestion of "serially defined object data structures" on Page 56 of Balachander. As mentioned earlier, Balachander discusses the identification of only the simple parameters (height, length, depth, etc.) of the generic feature shapes and does not discuss storing the coordinate system information necessary for the building of the features in the 3-D model.

Finally, with regard to Claim 28, the section of the text on page 33 of Balachander cited by the Examiner refers to the discussion of modifying input drawings to contain hidden lines prior to

the process of the extraction of isolated features. This is entirely different in context than the term "updated" in the text "binary file format can be incrementally updated" of Claim 28. The claim term refers to the ability to incrementally update the binary file format containing the finished 3D model after any changes have been made to it in the target CAD system.

Considering all of the above differences, it cannot be argued that Balachander teaches the above claims or any other dependent claims of the current application. Balachander does not disclose feature ordering through the use of multiple orthographic views of the features, which Claim 1 requires. A person of ordinary skill in the art, reading the claims in the context of the specification, would understand that Balachander did not teach such subject matter. The piecemeal, out of context statements from Balachander cited by the Examiner do not amount to the teachings needed to render the claimed subject matter obvious. In fact, most of the cited excerpts from Balachander do not stand for a proposition even remotely close to that recited in the claims. In view of the great differences between Balachander and the claims, and Balachander's complete failure to teach or suggest the claim limitations, Claims 1, 6-13, 19-22, 24, 26, and 28 are not anticipated by Balachander.

B. Balachander in view of U.S. Patent 6,212,441 to Hazama

Claims 58-63, 65-68, and 71-72 stand rejected under 35 U.S.C. §103(a), as being unpatentable over Balachander in view of U.S. Patent No. 6,212,441 to Hazama et al. ("Hazama"). The Examiner asserts that Hazama teaches the claim limitations that are not explicitly taught by Balachander and that the references in combination render the above claims obvious. Applicants respectfully disagree. Claim 58 has been amended to require that the step of "producing an ordered list of three-dimensional features" is done using 2-D geometry from multiple orthographic views of the three-dimensional features.

Claims 59-63, 65-68, and 71-72 depend from Claim 58. Applicants respectfully assert that neither Balachander, nor Hazama, nor Balachander in view of Hazama teaches the limitations of Claim 58. Thus, the dependent claims are not rendered obvious. Furthermore, Hazama does not teach the limitations that are explicitly noted by the Examiner as being absent from Balachander.

First, with regard to Claim 58, the Examiner's argument that item (d) of the claim "performing a profile analysis and feature analysis on the matched feature loops" has been taught by Balachander is incorrect. The text sections on page 18 and 19 of Balachander merely refer to the identification of simple, stand-alone geometric shapes and bear no relevance to the process of performing an analysis of the matched feature loops (which is required by Claim 58) to resolve the dependencies in the ordering of the individual features. Balachander also does not provide any teachings on "producing an ordered list of three-dimensional features" (item (e) of Claim 58) based on which the 3-D model can be built. The step of "consider[ing] the feature loops" identified by the Examiner on Page 49 of Balachander does not constitute ordering features as that step is meant in the claims. The loop hierarchy described in Page 49 of Balachander performs a simple extent-wise classification of the feature loops. This is done for only one orthographic view. **Claim 58 requires that the ordering is done using 2-D geometry from multiple orthographic views in the drawing.** The list of features on pages 54-56 of Balachander does not show any resolution of feature order or dependency. Balachander also does not provide any discussion on "writing the ordered list of three-dimensional features to a binary file format" (item (f) of Claim 58 of our invention). The output data file merely stores the classification of feature and the elementary feature parameters such as length, height and depth and stores no coordinate system information necessary for maintaining an ordered list of the features.

Furthermore, Applicants submit that Hazama is drawn to a process of developing 3-D sheet metal parts from 2-D sheet metal drawings only and is used for identifying manufacturing features. In contrast, Claim 58 as amended is drawn to a method that involves identifying and ordering elements using geometry from **multiple orthographic views** of generic 2-D mechanical drawings to form parametric, design feature-based 3-D models.

With regard to Claim 60, the figure in Balachander referenced by the Examiner (Figure 5.23) on page 55 only depicts the classified form features that have been identified. As already discussed, Balachander does not teach any order resolution of features. Thus, it does not teach producing a parametric, feature-based three dimensional model as required by Claim 60.

With regard to Claims 61-63, the sections of Balachander on page 18 cited by the Examiner refer to the orthographic views contained in the input 2-D drawing. On the other hand, Claims 61-63 refer to the two-dimensional views produced from projecting the three-dimensional model back onto the world 3-D planes. This is done after the 3-D features have been identified from the input 2-D drawing, their ordering completed and the 3-D model built, with an aim to provide model verification.

In the rejection of Claim 65, the figure (Figure 5.19) on Page 47 of Balachander cited by the Examiner actually describes the results of the identification of isolated loops in a 2-D drawing. This is entirely different from Claim 65, which refers to the automatic splitting of geometric entities (lines, arcs, circles etc.) in the corrected 2-D input drawing to form a network of further indivisible entities. Lacking the teaching of this initial claim limitation, the citation of Hazama is not sufficient to render Claim 65 obvious in combination with Balachander.

With regard to the rejections of Claims 66-68, the text on page 26 of Balachander cited by the Examiner differs from that in the claims because the center points for arcs and circles are not included in the normalization, whereas the translation of the arcs and circles in the claim would take care of the center points as well. Also, since the implementation of the process in Balachander was done in C, it differs from the use of object-oriented class data structures used in the current claims. The term "translational" used in classifying the identified features on page 56 of Balachander refers to the type of feature (translational or rotational, etc.). It differs from the claim term used in Claims 67 and 68, where the geometric entities are shifted (translated) based on the common origin fixed in Claim 66.

In the rejection of Claim 71, Balachander does not provide any teachings on any corrections done to a 2-D drawing prior to their use in feature extraction and therefore does not teach the sub-steps performed in step (c) in Claim 71. Also, the term "subpart" in Claim 71 refers to an independently identifiable 3-D join feature and cannot be compared to a simple generic shape like a cone, as discussed on page 19 of Balachander. Furthermore, the terms subpart extraction and matching refer to the process of traversals through the orthographic views in the corrected input 2-D

drawing to extract the subparts and then, to match the extents of the subparts in one view along subparts or combinations thereof from other orthographic views. These two sub-steps of the claim are not taught or suggested by any extraction procedure discussed in Balachander. Finally, the term "nested loops" in Claim 71 refers to any internal feature loop that may be isolated or shares a border (non-isolated) with the outer parent feature loop. The term differs in scope from that used in Balachander because identification of non-isolated feature loops was not been discussed at all by Balachander due to their greater complexity.

Finally, with regard to Claim 72, the section of text on Page 46 of Balachander has no relevance to Claim 72. This section discusses a strategy for simpler representation of feature loops containing circular segments. On the other hand, the term "profile analysis on each loop match" used in Claim 72 refers to the geometric test on each feature loop to determine the most likely type of feature (extrusion, revolve, fillet, chamfer, hole etc.) and the volume operation. Balachander discusses merely the classification of form features identified and the elementary parameters. Since no feature ordering information is stored in the process described in Balachander, it is not appropriate to apply it to the process of "building feature subtrees," "building feature relations on the subtrees," "building a model tree based on the relations," and "producing a final feature tree...ordered list of three dimensional features" as defined in Claim 72. Again, Figure 2.1 on Page 9 of Balachander merely refers to the classification list of form features widely available in mechanical CAD literature back in 1994 and bears no relevance to the tree/subtree terminology used in Claim 72 to describe the process of storing and building the final 3-D model.

Applicants respectfully assert that Claims 58-63, 65-68, and 71-72 are patentably distinct from Balachander in view of Hazama. These references do not teach feature ordering through the use of multiple orthographic views of the features, which Claim 58 requires. Furthermore, these references fail to teach numerous other claim limitations, as discussed above. Thus, Balachander in view of Hazama do not render Claims 58-63, 65-68, and 71-72 obvious.

VI. Conclusion

Applicants respectfully submit that, in light of the foregoing comments, Claims 1, 6-13, 19-22, 24, 26, 28, 58-63, 64-68, 71, and 72 are in condition for allowance. A Notice of Allowance is therefore requested.

If the Examiner has any other matters which pertain to this Application, the Examiner is encouraged to contact the undersigned to resolve these matters by Examiner's Amendment where possible.

Respectfully submitted,

T. Ling Chwang
Registration No. 33,590
JACKSON WALKER L.L.P.
901 Main Street, Suite 6000
Dallas, Texas 75202
Tel: (214) 953-5959
Fax: (214) 661-6870

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